Diversity in Mathematics Journals

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Contents

Abstract

Academic journals are where experts in their field publish their research in forms of articles. These journals tend to set the trends in their respective fields. Because of this, academic journals are very important to academia. My research aims to answer the question: How diverse are the top seven math education journals in terms of gender and country of origin? Having diversity at the forefront of academia allows for multiple perspectives to decide what is important and worth researching. I looked for diversity among the editorial boards and the authors they choose to publish. While researching, I looked for gender and country of origin for each person. The data gathered shows trends that favor a certain group of people above all others, specifically American men.

1 Introduction

My research aims to discover the range of diversity in terms of gender and country of origin found in the top ranked mathematical journals. I researched how many articles are being published by men and women. I also found out which countries these authors are writing from. Similarly, I discovered how many men and women are on the editorial boards of the chosen journals and which countries they represent. These results were placed into tables and graphs for better analysis. If found, the graphs will show any common trends among the journals. Some common trends to consider include a gender majority among authors and editors, and country dominance within each journal. My advisor helped me choose some of the most popular mathematics education journals to use for this study.

Mathematics journals are an interesting metric because they develop the trends that trickle down through the mathematics community. It is important to know whose perspective is being highlighted and whether or not they have any bias. If popular math journals are only publishing articles from authors that fit a certain mold, then the journals are curating their ideal content. This content is then taken as reputable and leaves impressionable marks on young mathematicians. This is only one reason why diversity on math journals is so interesting. Another reason why diversity in this area is important is to encourage minorities to delve into the area. The more diversity found in an area, the more perspectives can be found.

This paper will begin by giving a brief background about why I chose this topic and why it is important. It will then transition into the literature review. There has not been much research done on this topic in the past. I looked for similar articles, but most of the information I gained was based on journal ranking. Because of this, my literature review discusses what journal ranking is and how it is done. I will introduce some interesting topics that are closely linked to journal ranking. After the literature review, I will discuss the methods I took to perform this research. Finally, I will explain the results found and discuss the importance of them.

2 Background

With my research, I hope to explore the diversity in terms of gender and country of origin among the top ranked mathematics journals such as their editorial boards, authors, and articles.

Previous articles about academic journals have shown many flaws in the current ranking system (Williams and Leatham, 2017). One of the biggest flaws found by researchers is the idea of monoculturalism (Molina-Andrade, 2020). Monoculturalism allows for a specific culture to thrive in the provided environment. The other issues include keeping the reputations of journals the way they are (Nivens, 2017). This topic is particularly interesting to me because I am part of a minority in the mathematics field. As a Latina in math, I have not come in contact with many others like myself. In 2017, about 21 percent of the professors were women (Association of Women in Mathematics. Also in 2017, only about 3 out of 500 students graduating with a Ph.D. in mathematics were Hispanic or Latina women (Association of Women in Mathematics). Having this lack of representation can make women feel as though they do not belong in the field. With these top ranked journals setting the standard for mathematics professionals, I would like to see who is being published and who is editing their articles.

Before transferring to the University of La Verne, I experienced a lot of push-back from others majoring in mathematics. I was one of three women in my class. Among the three women, I was the only one who was not white. My male counterparts made me feel as though I was the outsider in our situation. This was evident in their superiority complexes. They always assumed that I was wrong when we got different answers for a math problem. When the professor would say I was correct, they would make excuses for themselves rather than admit they got the problem wrong. Professors also only highlighted articles and projects done by males. Now that I am in a much more open and welcoming environment, I would like to see what all else is out there. According to the Association of Women in Mathematics 2017, about 40 percent of bachelor's and masters degrees in mathematics are held by women (Association of Women in Mathematics). Only about 29 percent of doctoral degrees in mathematics are held by women. Only about 18 percent of those are women of color. As I have done research for this project, I have found that there is controversy among the way academic journals are ranked. Authors have found that there are claims of ranking websites being biased (Williams and Leatham, 2017) Others claim that the current ranking systems have a negative impact on authors' because of reputations. Due to these issues and more, authors have also offered their opinion on improving the ranking systems (Molina-Andrade, 2020). This is an important issue because we are the future professionals who will be publishing in academic journals. As this is the case, we want to walk into a working system.

3   Literature Review

Journal ranking can be broken up into two main categories, citation based and opinion based ranking. Citation based ranking is favored by some because of its seemingly objective nature. This type of ranking evaluates how many times an article or journal is cited. Some popular programs used for this type of ranking include Impact Factor and Google Scholar Metric. Opinion based ranking is based on the opinions of other scholars in the same field.

3.1   Monoculturalism

A common argument found among articles is the idea of monoculturalism. This is the process of supporting or advocating for the culture of a single social or ethnic group. This can happen in many different environments and develops over a long period of time. It can often be accompanied by microaggressions and favoritism. After completing my research, I believe that modern journal ranking seems to only support their ideal western European standards. This bias can be found in citation ranking systems because they only count citations for journals that are in certain databases. For example, say a citation ranking system only counts citations for articles in journals x, y, and z. If an author publishes an article in journal a, their citations would not be counted by this ranking system. Thus making their article less known to others (Williams and Leatham, 2017). Similarly, Andrade-Molina argues that the current ranking system shows little to no representation for anything that is not in English (Molina-Andrade, 2020). This was supported by gathering data on popular journals in Ibro-America. Andrade-Molina's research found that even the most known Ibro-American journals did not compare to those western European journals that we are all familiar with. Similarly, there are biased features found in the ranking system known as Google Scholar Metrics (GSM). GSM is known to rank established journals higher than others (Nivens, 2017). Williams found biased ranking based on non-academic features (Williams and Leatham, 2017). The research also found some issues with other citation based ranking systems.

The author states,

Beyond issues of database and search accuracy, a number of studies have suggested reasons for caution with the exclusive use of the IF. The IF, or impact factor, measures how much an article in a journal has been cited in a particular year. Problems within this program include bias toward certain kinds of articles ... the tendency to differ

across disciplines and over time ... and a susceptibility to being affected by publication

lag, article lengths, self-citations, and a number of other factors not obviously related

to research quality" (Williams and Leatham, 2017).

This makes one wonder how well these citation based programs respond to content not written in the language they are programmed to read. How well do citation based ranking systems rank articles not published in popular journals? Does the language barrier have any effect on the program's ability to collect all corresponding citations? These questions push authors to question the systems.

3.2   Reputations

Top ranked journals have reputations that they are keen on keeping. This can have an influence on the material they choose to publish under their name. Because of this, authors strive to get published in the top ranked journals to improve their own reputations as professionals in the field. This makes getting published in these journals extremely competitive. One author found that journal reputations are self-reinforced thus making it difficult to change (Nivens, 2017). Similarly, the people being asked to rank journals can be biased if they have worked for said journal, thus keeping the highly ranked journals highly ranked (Williams and Leatham, 2017).

Another issue some authors run in to is the cost of publishing. Authors can have excellent work go unrecognized because they cannot afford to publish in the top ranked journals. To combat this issue, some journals have decided to put open access into place (Chapron, 2006). This means that anyone can publish in their journal regardless of financial ability. These journals, however, are likely to rank lower than traditional journals (Molina-Andrade, 2020).

3.3   Suggested Updates

Through my research I have found that those who criticize the academic journal ranking system have made suggestions on how to best update it. One approach is to develop a new algorithm that applies fuzzy cluster analysis to opinion based ranking (Stephani, 2011). The hope of this is to avoid citation based ranking all together. Another study suggests that all journals use qualifying for publication as a guide for ranking (Molina-Andrade, 2020). This would allow those who cannot financially afford to get published to still get the recognition their work deserves.

Another study claims that the ranking system will improve as the internet continues to advance (Millet-reyes, 2008).While this study was done years ago, I believe that even modern technology will continue to advance as the years go on.

4   Methods

I started this project not knowing much about the reputations of academic journals. After some research, I was able to pinpoint the top ranked mathematics education journals. I decided to research within the following journals: Educational Studies in Mathematics (ESM) (Prediger and Wagner, 2023), The Journal of Mathematical Behavior (JMB) (Zazkis, 2023), Journal for Research in Mathematics Education (JRME)(Herbst, 2023), Journal of Mathematics Teacher Education (JMTE) (Potari, 2023), ZDM Mathematics Education (ZDM) (Kaiser, 2023), International Journal of Mathematical Education in Science and Technology (IJMEST) (Foster, 2023), and the International Journal of Science and Mathematics Education (IJSME) (Wu, 2023). These journals were chosen because they were the intersection of top 11 journals ranked by Toerner and Arzarello (Toerner, 2017) and Williams and Leatham (2017), Scopus and Google Scholar (from Nivens and Otten, 2017) in the last five years.

In each of the journals, recorded everyone on the editorial boards. I also kept track of every article published within the last seven years. I wrote down each article published along with the authors, their emails, and gender. This allowed me to find their demographics along with other information. Once I gathered all of the data, I created data tables. Data include countries of origin and gender. I decided to use these parameters to look for diversity because it was the simplest information to find on all of the authors and editors.

5   Results or Findings

The data collected from all seven journals mentioned in the methods section above was gathered and placed into graphs and charts. Figures three through thirty can be found in the appendix of this paper. Each journal has four graphs: Editors based on country, editors based on gender, authors based on country, and authors based on gender. I chose to only use the male and female gender due to the nature of the results. Figure 1 displays all the gathered data for the

Journal	Number of countries	Female	Male	Total
ESM	31	470	641	1111
IJMEST	39	357	922	1279
IJSME	39	478	794	1272
JBM	29	503	411	914
JMTE	29	205	279	484
JRME	9	202	286	488
ZDM	38	506	924	1430

Figure 1: Author data fromn the last 7 years

Journal	Number of countries	Female	Male	Total
ESM	28	37	38	75
IJMEST	11	15	21	36
IJSME	20	28	52	80
JBM	14	15	33	48
JMTE	20	15	33	48
JRME	10	11	25	36
ZDM	8	3	11	13

Figure 2: Editor data from the last 7 years

authors. An example of how to use the table is as follows. Within the last seven years, ESM has published articles written by about 1,111 authors. Of those authors, 470 were female and 641 were male. Figure 2 displays the gathered data on the editors of each journal. The authors published represented 31 different countries. The percentages of these tables can be found in figures 4, 3, 6, and 5.

6   Discussion, Applications or Teaching Implications

The data collected for the authors published by the chosen seven journals shows a favor for men over women. The only journal that published more women than men in the last seven years is the Journal of Mathematical Behavior. Women make up about 55 percent of the authors whereas men make up about 45 percent of the authors. While this is the only among the seven to have published more articles by women, it is interesting that the gender gap is considerably smaller

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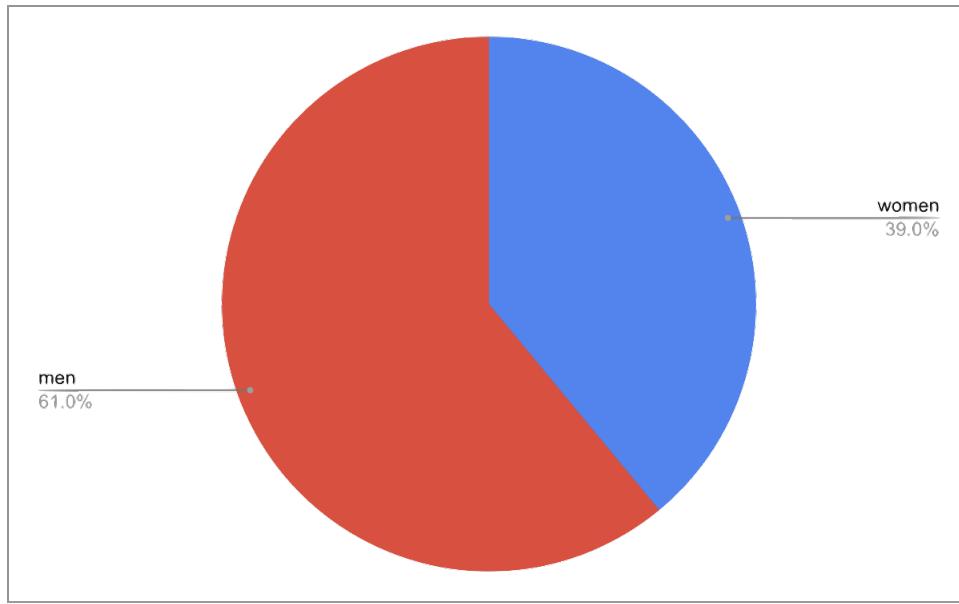
Figure 3: Authors by gender percentage from the last 7 years
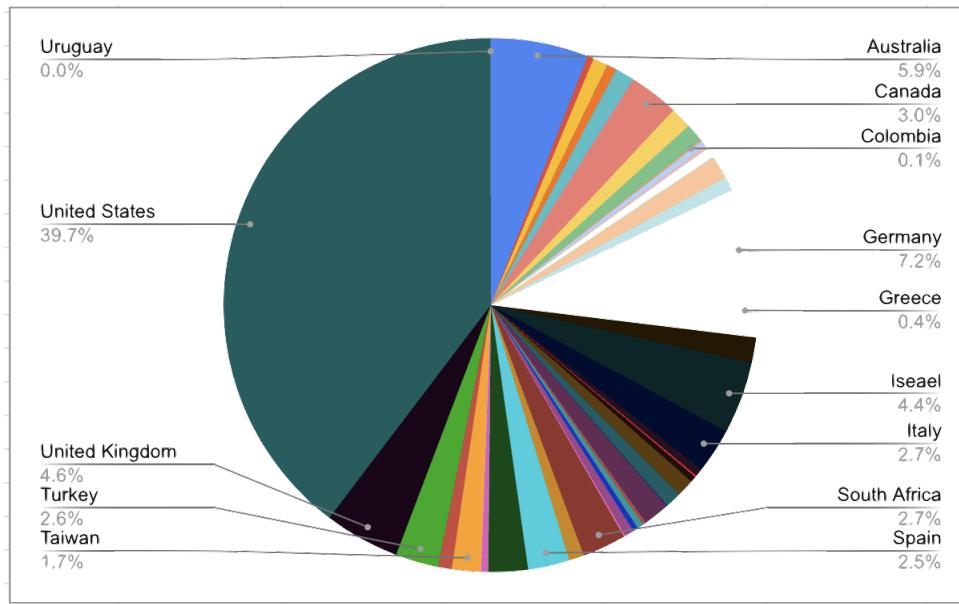
Figure 4: Authors by country percentage from the last 7 years

than the gender gap that favors men. In the other six journals, women make up anywhere from 27 percent to 42 percent of the published authors. This data brings up the question, why is the gender gap that favors men significantly larger that the other way around? An interesting thing to point
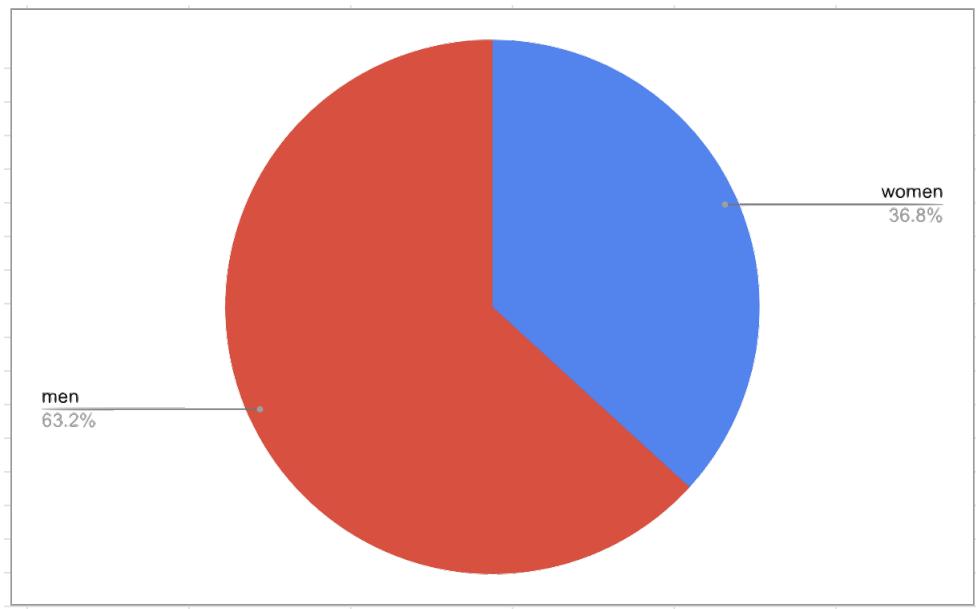
Figure 5: Editor by gender percentage from the last 7 years
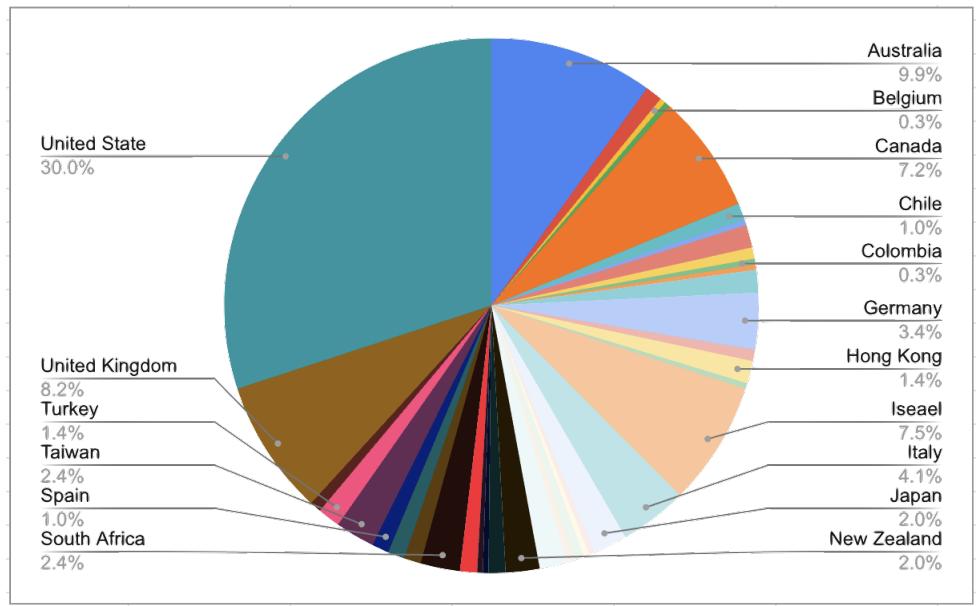
Figure 6: Editor by country percentage from the last 7 years

out about the journal who published more articles by women then men in the last seven years is that about 66 percent of the authors published in total are from the United States. Another fact that stood out to me was that the United States has the most representation amongst the authors.

As seen in the graphs, the United States has the biggest section, making up anywhere from 26 percent to 93 percent of the authors' home countries. JRME has the smallest range in countries represented by authors with the United States being about 93 percent and the next highest being Israel with about 1.8 percent.

A discovery found in this research is that six out of the seven journals included in this research have more men than women on their editorial boards. As seen in the graphs, when men make up more of the editorial board, women make up about 21 to 41 percent. The only journal that does not share this statistic is ESM. Their editorial board is divided evenly among men and women. Another interesting result from this research is that six out of the seven journals have a majority of their editors from the United States. The US holds the biggest editorial percentage in six out of seven with the percentages ranging from 10 to 60 percent. The only journal who does not have the United States as the most represented country by editors is IJMEST. IJMEST has 30 percent of their editors from Australia and 16 percent from the US. The US being the second most represented country by their editors.

7   Conclusion

The purpose of this research was to examine the diversity found in mathematics journals. Diversity is an attribute that should be found in all communities. The mathematics community is no exception. Through my research, I explored the diversity among the top ranked mathematics journals such as their editorial boards, authors, and articles. Articles about academic journals have shown many flaws in the current ranking system. One of the biggest flaws found by researchers is the idea of monoculturalism. Monoculturalism allows for a specific culture to thrive in the provided environment. It is evident that western European culture is thriving in the academic journal industry. Choosing these journals over others, such as those from Ibro-America, further enforces the idealistic views. The other issue we discussed was that of reputations. Highly ranked journals stay at the top because authors willingly participate in the corrupted system. After reviewing the key findings, I learned that the ranking systems do not focus on diversity, inclusion, or any humanistic aspects. Their main focus is on the citations or opinions of other professionals in the field. I would like to go beyond the current ranking systems and look at the demographics, specifically gender of the authors and editors. My goal is that in doing so we can re-humanize the

process of getting published in a top ranked journal and encourage a diverse population to publish their work. Each researcher having their own ideas about what is wrong with the way journals are ranked, but seldom did they contribute ideas about how to fix the systems. In this research, I discovered that the majority of articles published in popular mathematics journals are published by American men. This trend can be seen quickly when examining the data.

While there were significant trends found among the data gathered, there were also limitations I encountered throughout the research process. The first limitation I encountered was time. I deeply underestimated the time it took to go through seven years worth of articles for seven different journals. Each journal publishes about eight volumes per issue. Each issue has anywhere from ten to twenty-five articles in it. Another limitation I encountered was lack of information. Some authors were very easy to locate online because the journals list authors along with the institute they associate with. This would quickly lead to either their personal website or their page on the school's website. Other authors were not so simple. Some were not associated with an institution. Others only reported their initials and institution to the journal. Some were not in academia at all. These authors required much more time to find anything about them. These are just some of the limitations I encountered while doing my research.

As I have dedicated much time to this research, I have established a connection with the material. I would like to continue this research in the future with different parameters. I chose to focus on mathematics education journals for this research because I am a math major. For future research, I would like to expand to include STEM journals and other academic journals. Making this change would allow me to see if there is similar trends across all disciplinarians or if it unique to mathematics or to STEM. Another route I would like to take this research in the future is based on countries. The journals used in this research are common in the US. I would like to find out if the popular journals differ based on country and what diversity looks like in theirs. Regardless of the parameters set, I look forward to continue this research in the future.

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Appendices

A   Some Appendix

USA
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UK
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The Netherlands
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Taiwan
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Sweden
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South Africa
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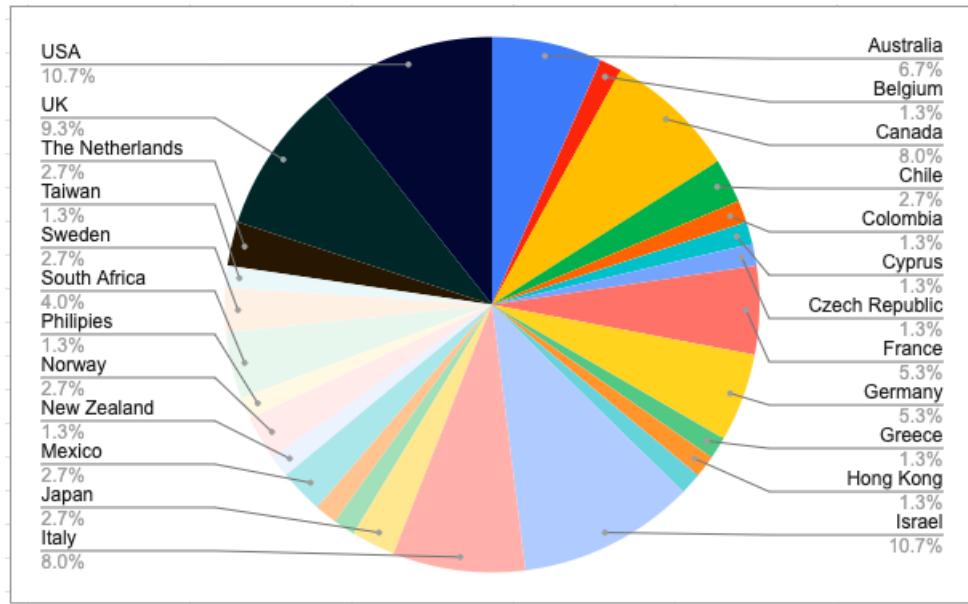
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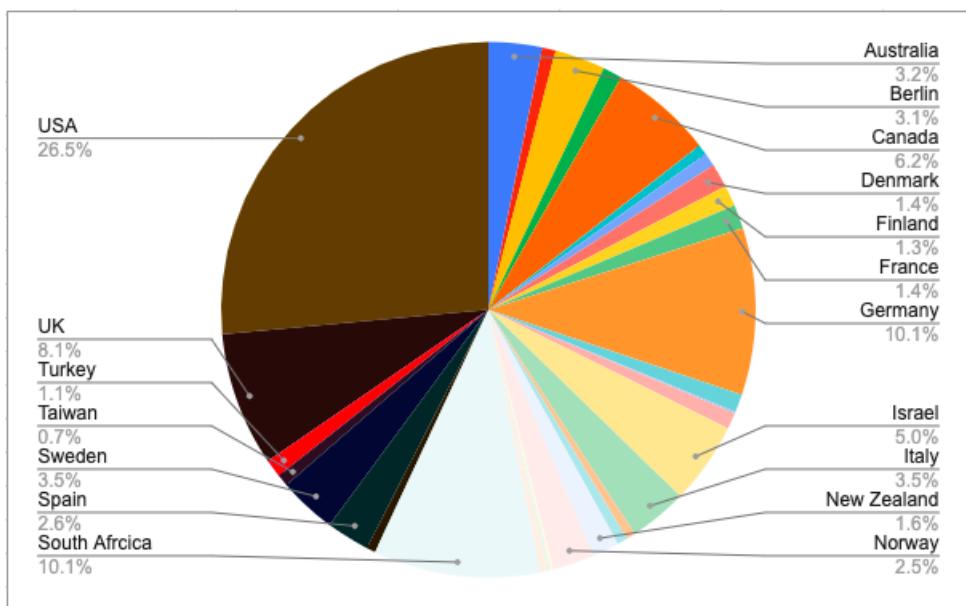
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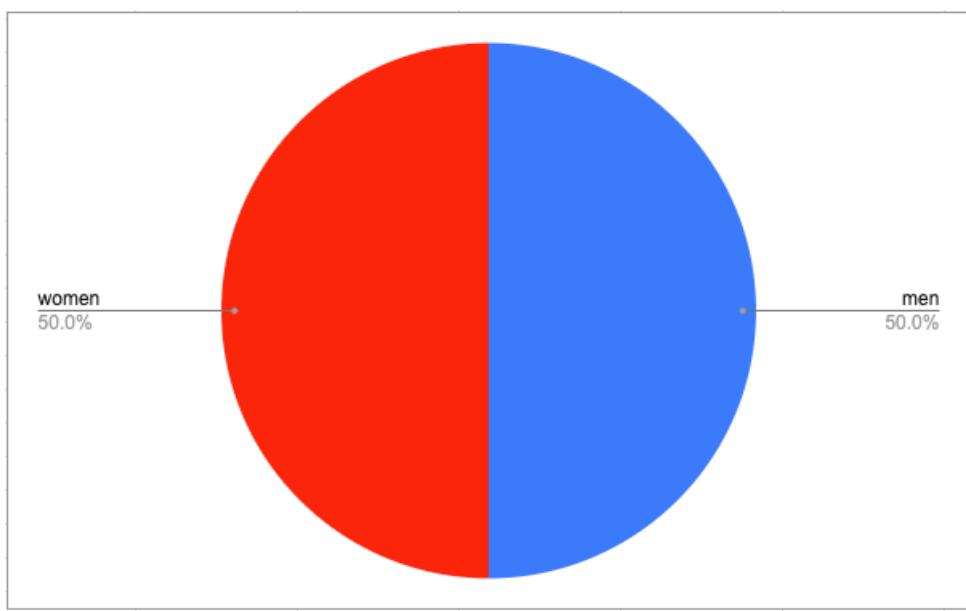
Figure 9: ESM editors by gender

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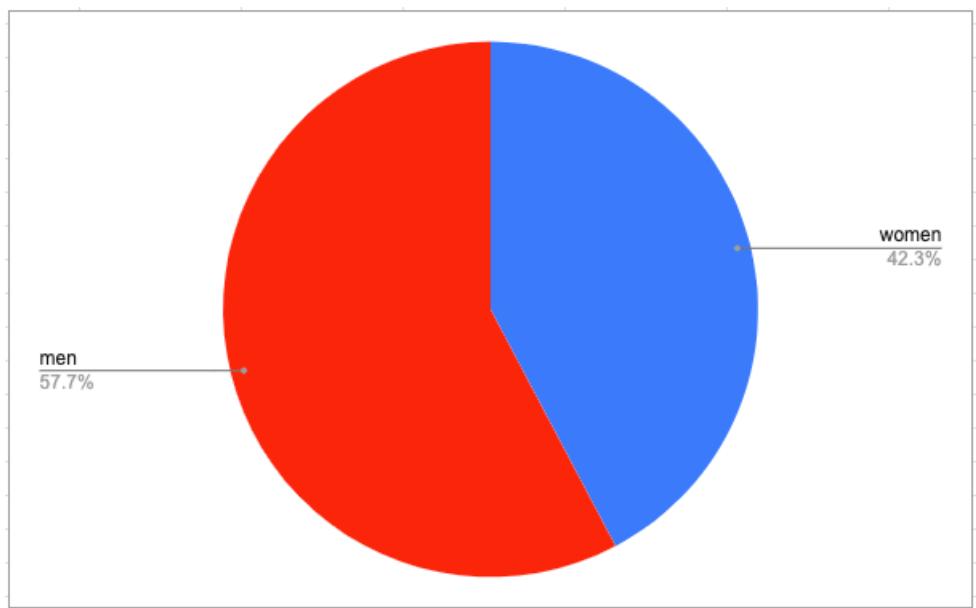
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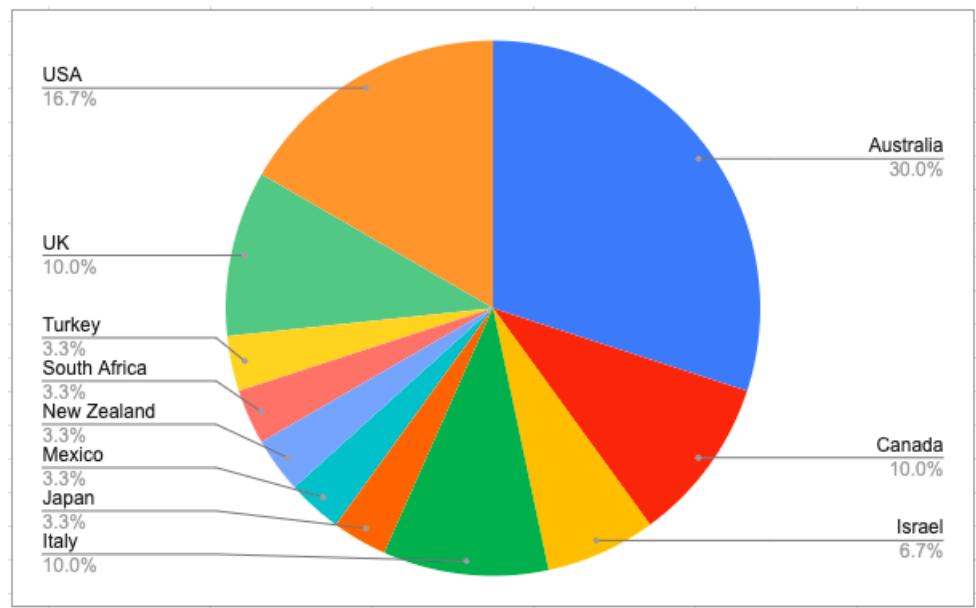
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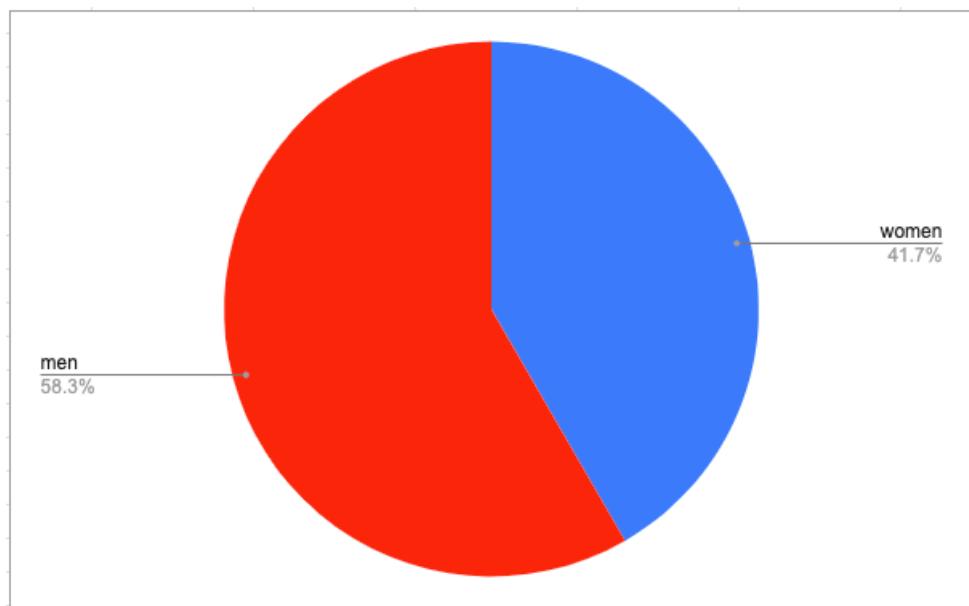
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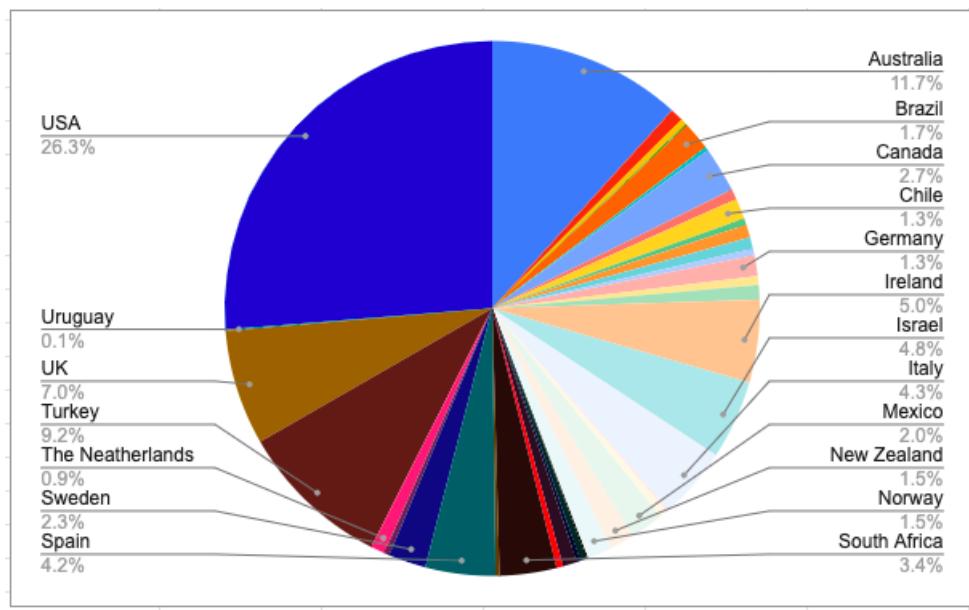
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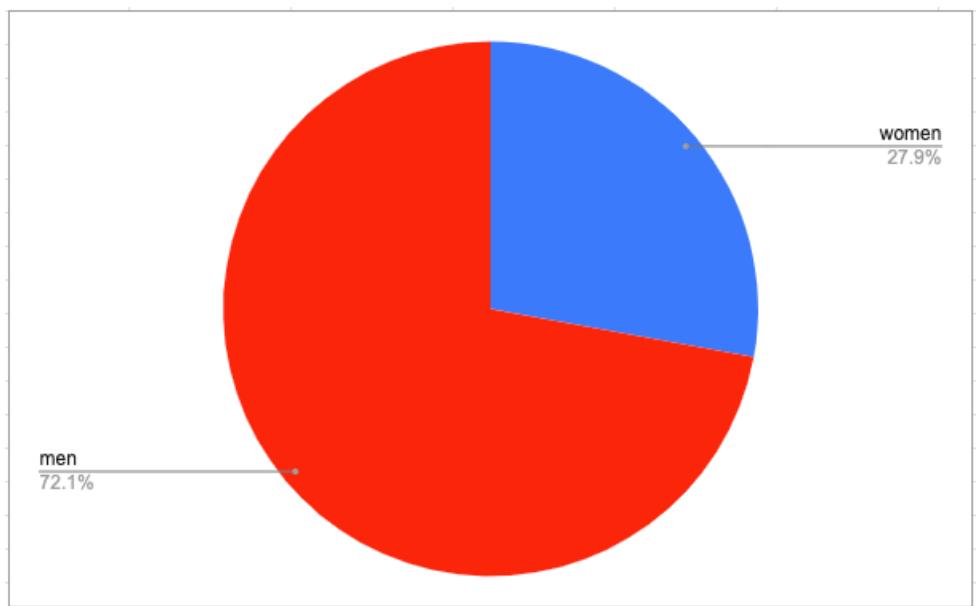
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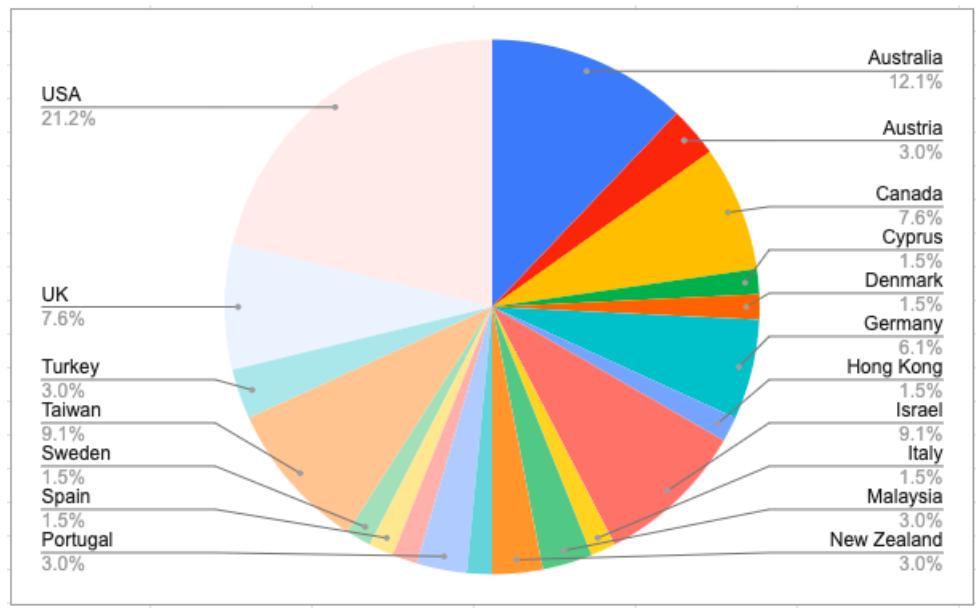

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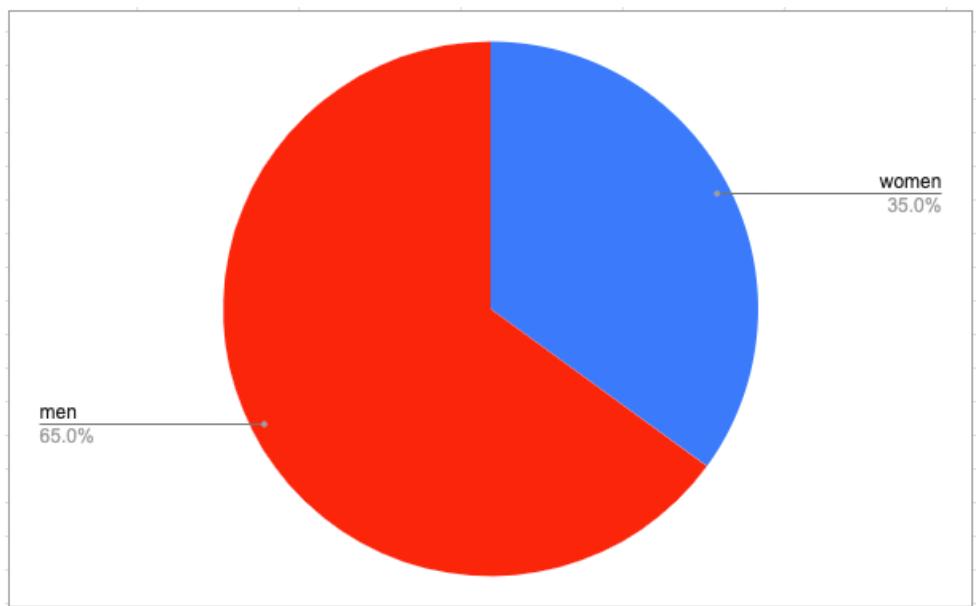
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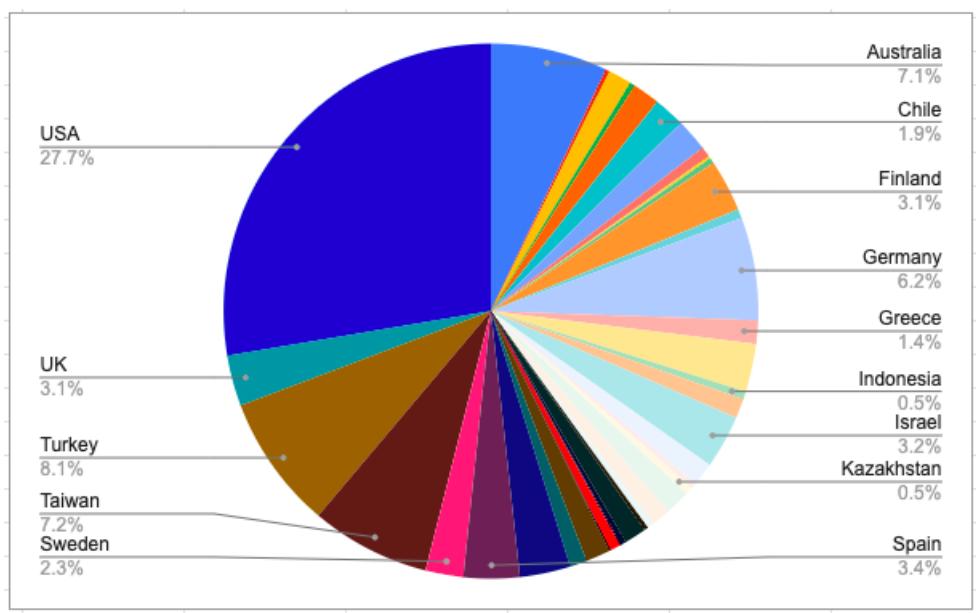
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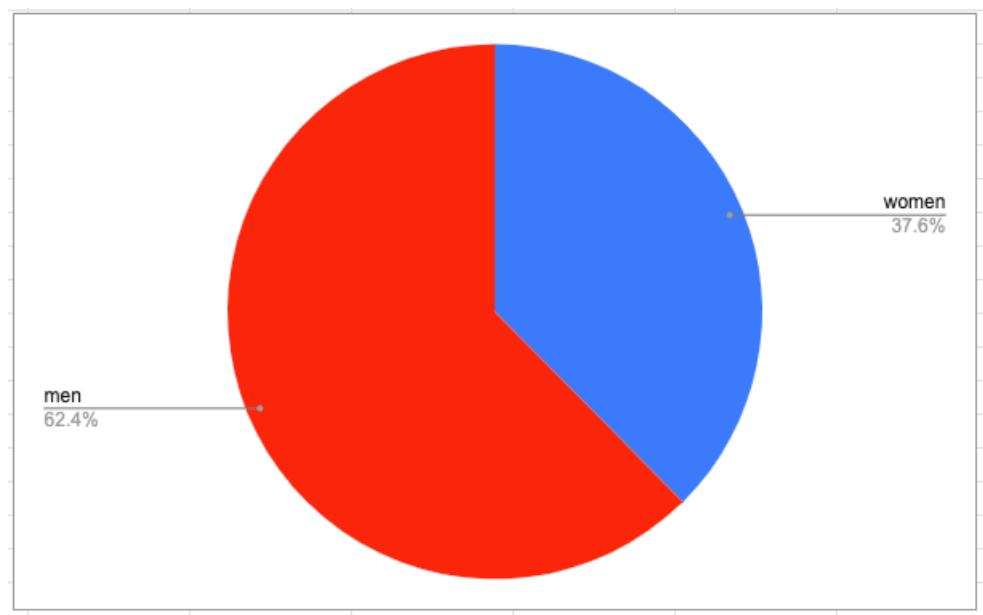
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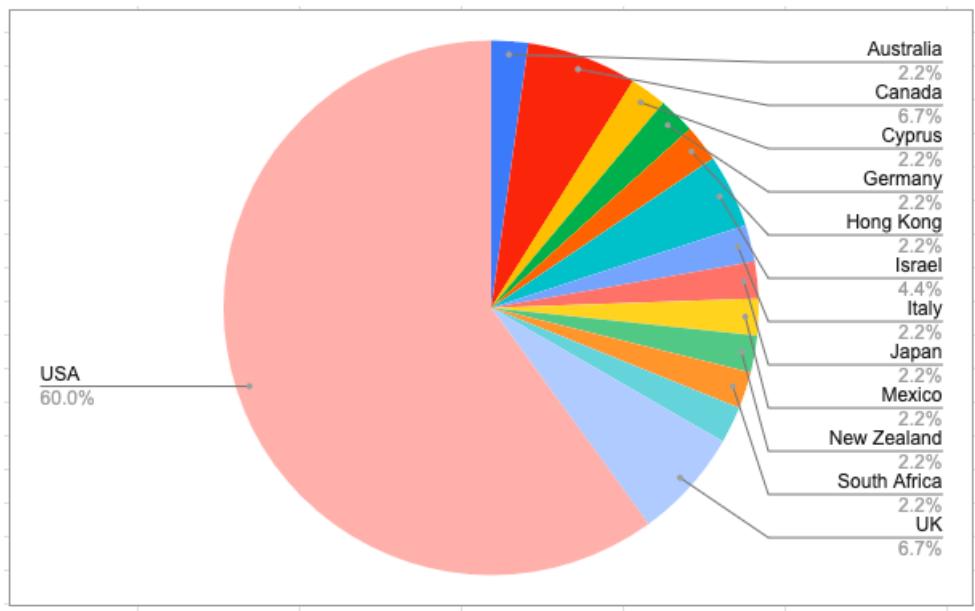
Figure 19: JBM editors by country

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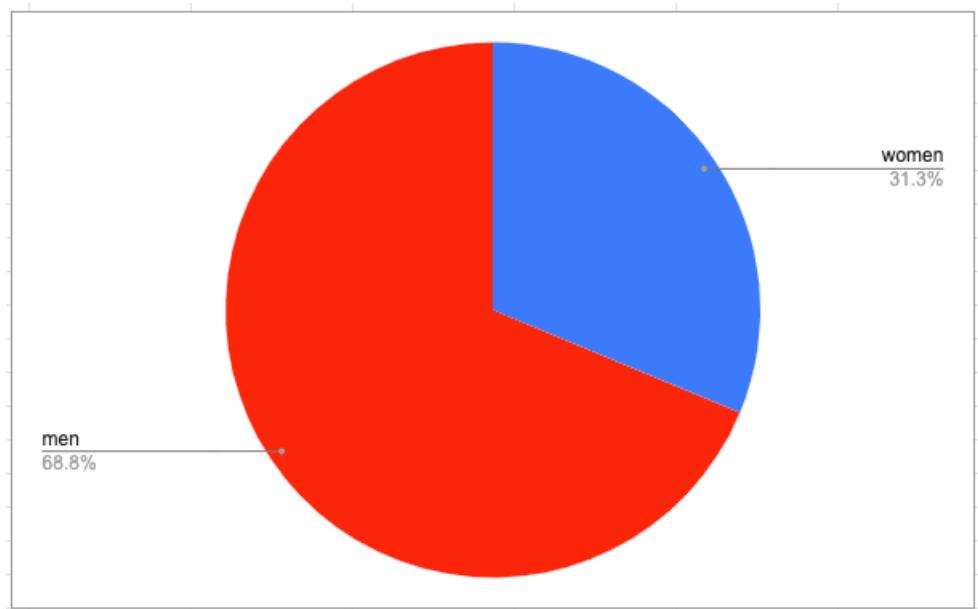
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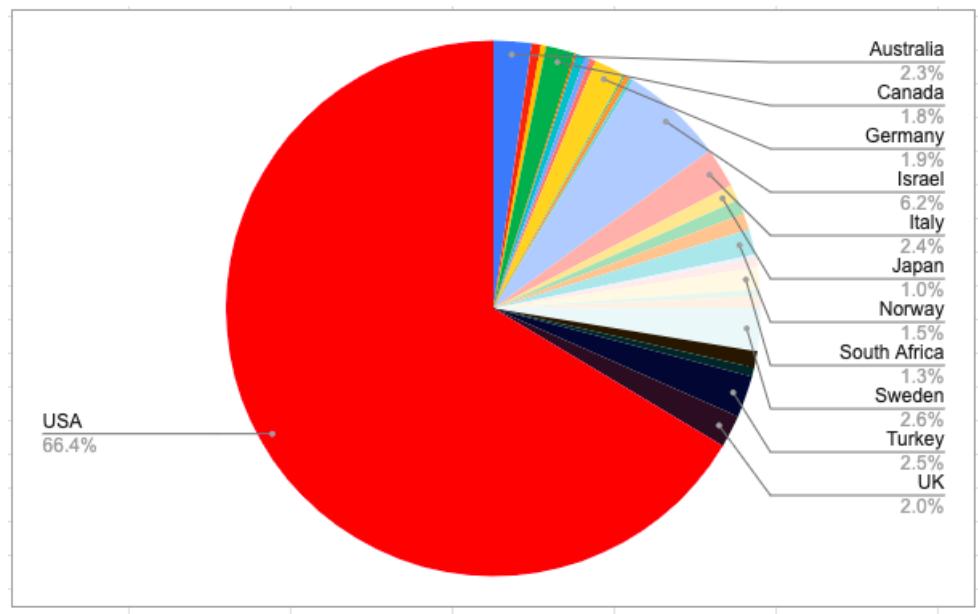
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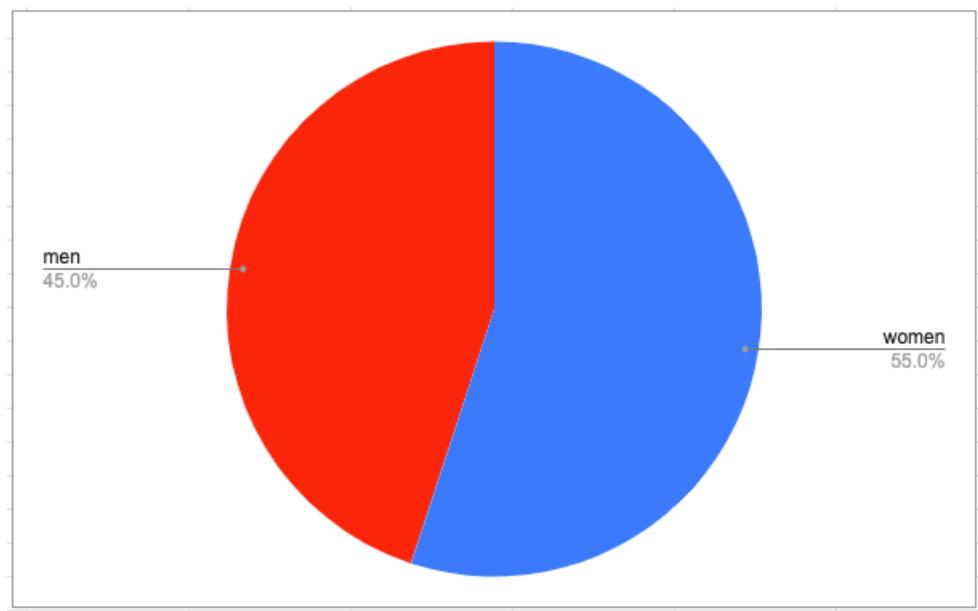
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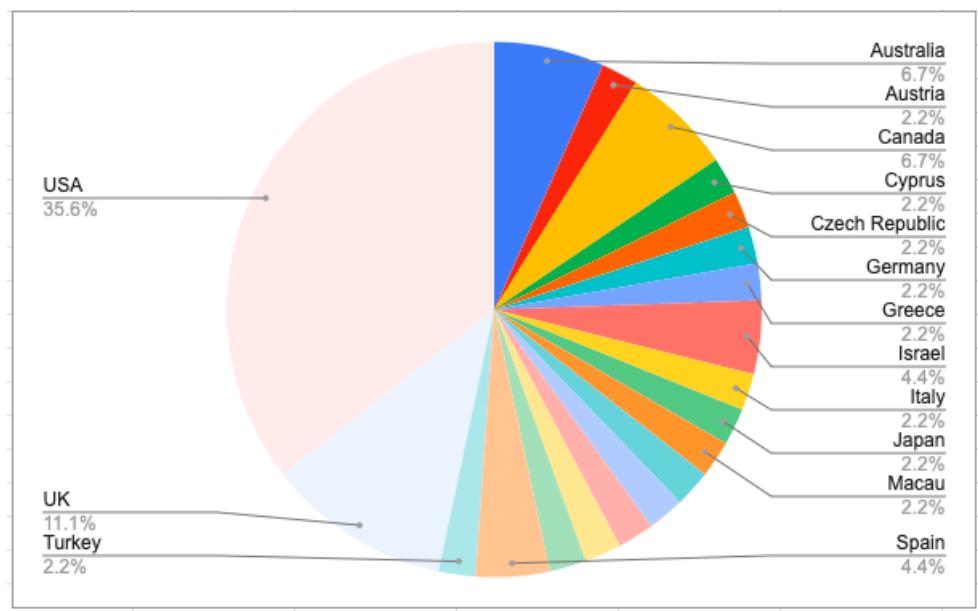
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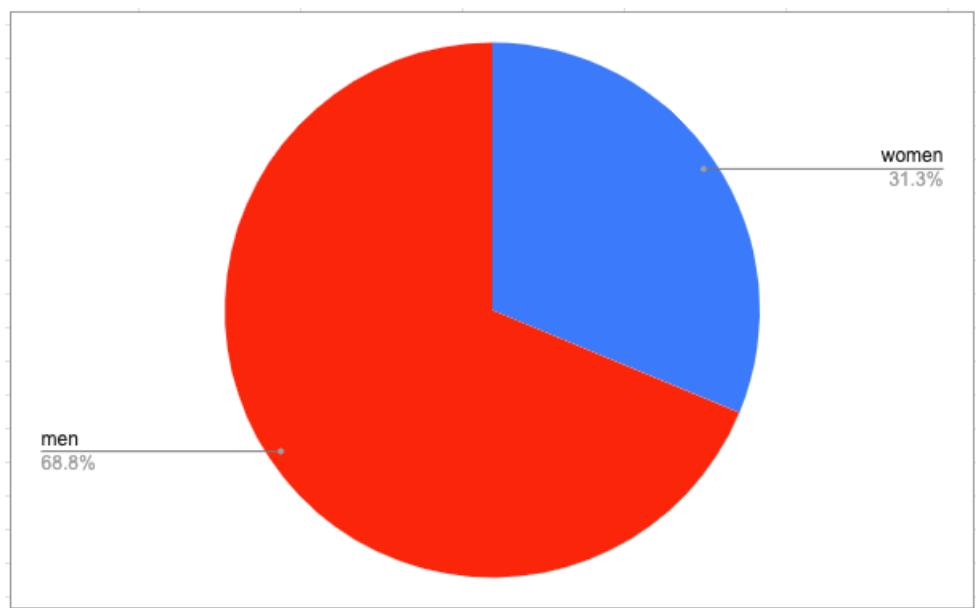
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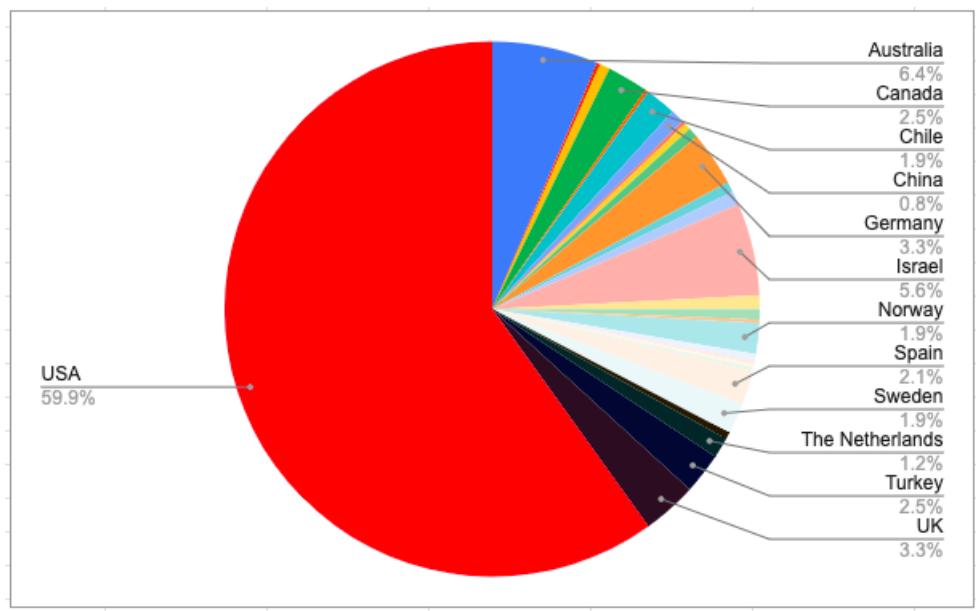
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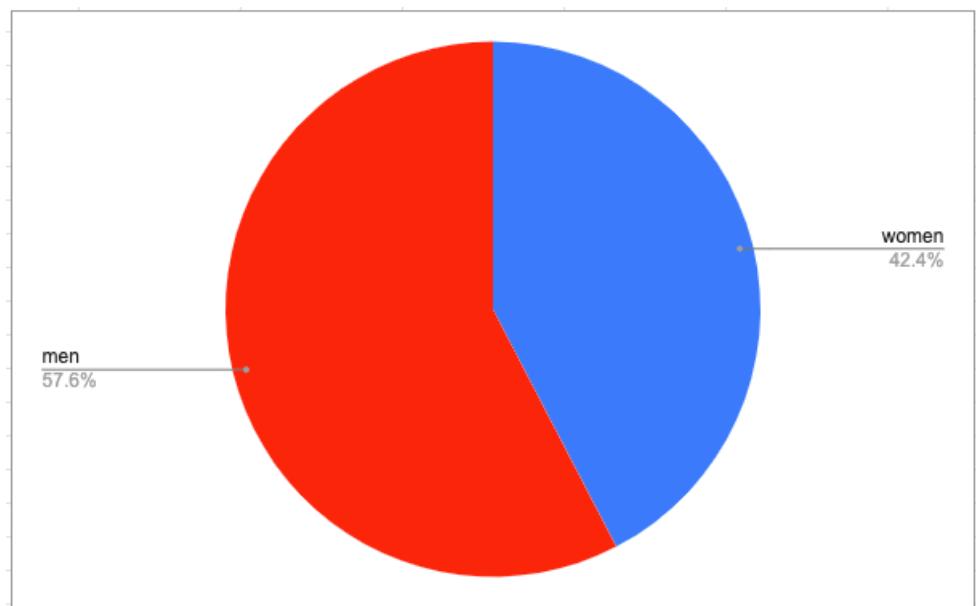
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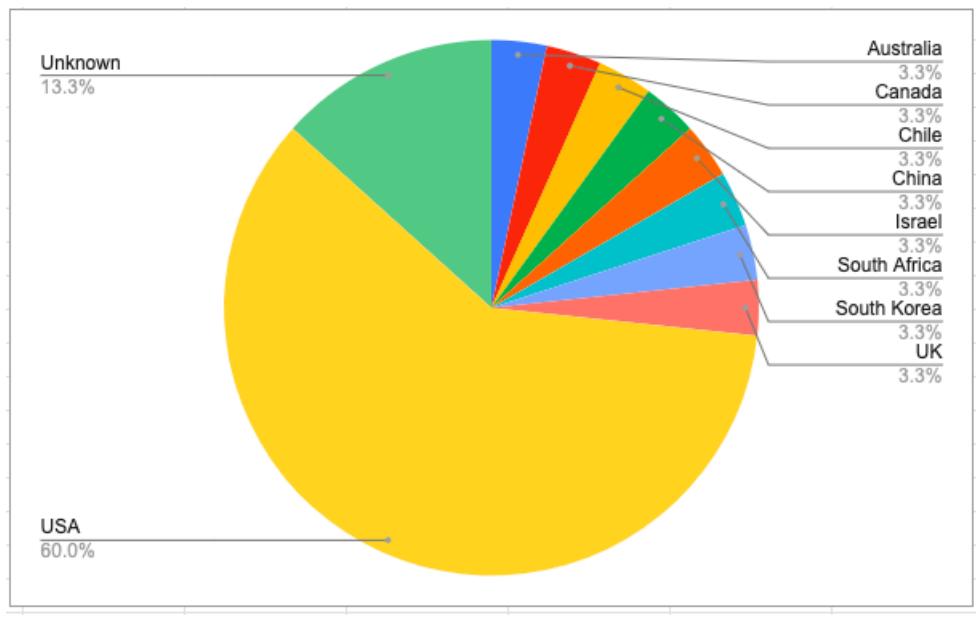
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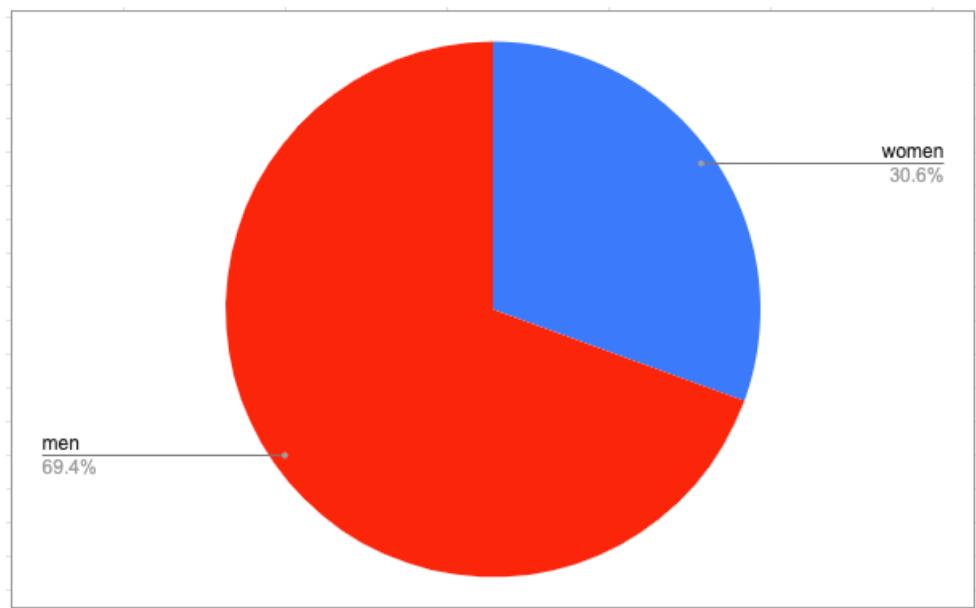
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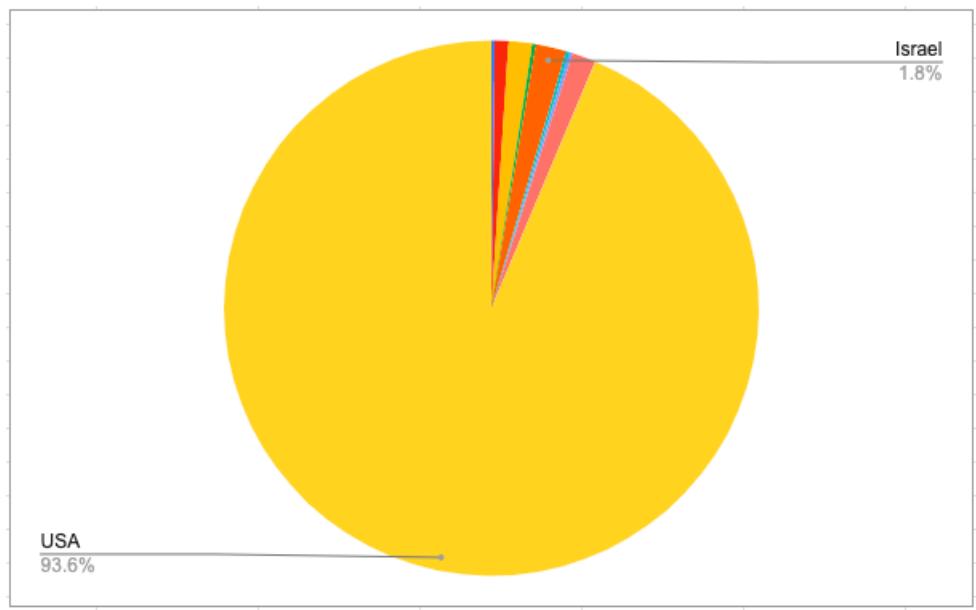
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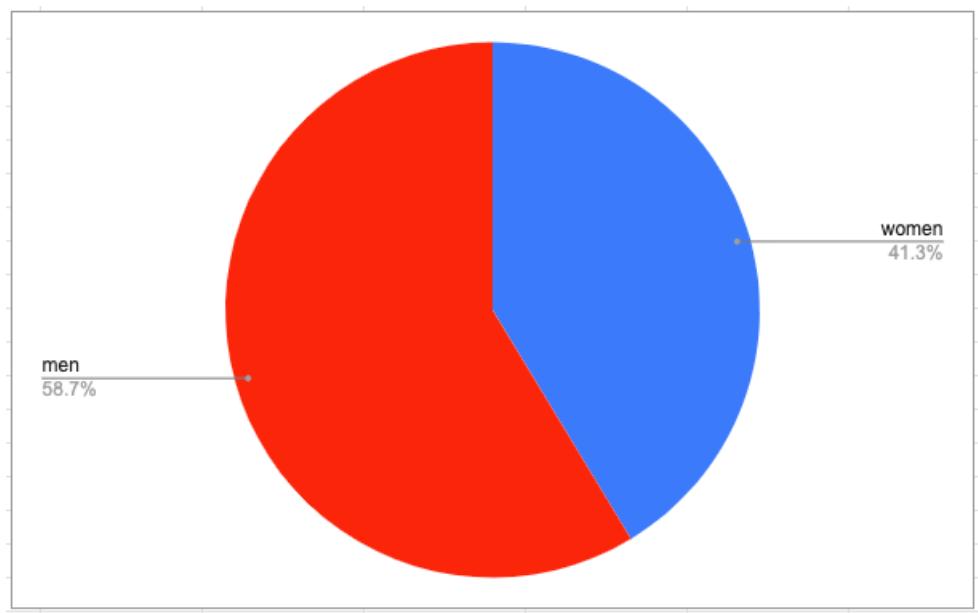
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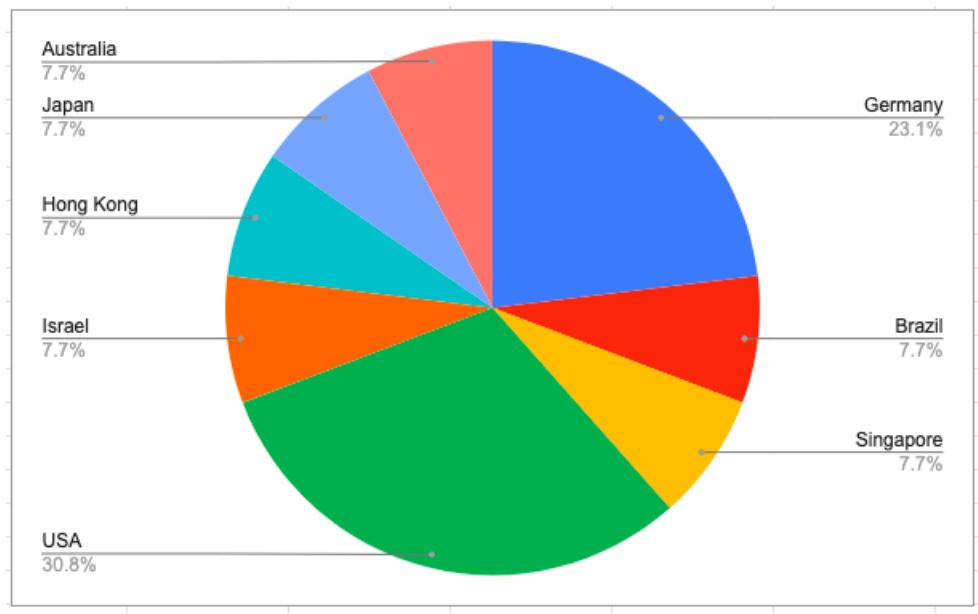
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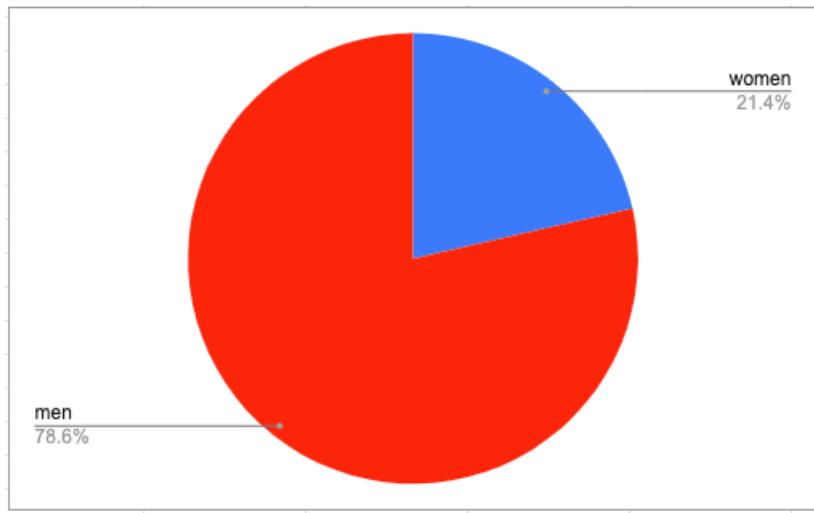
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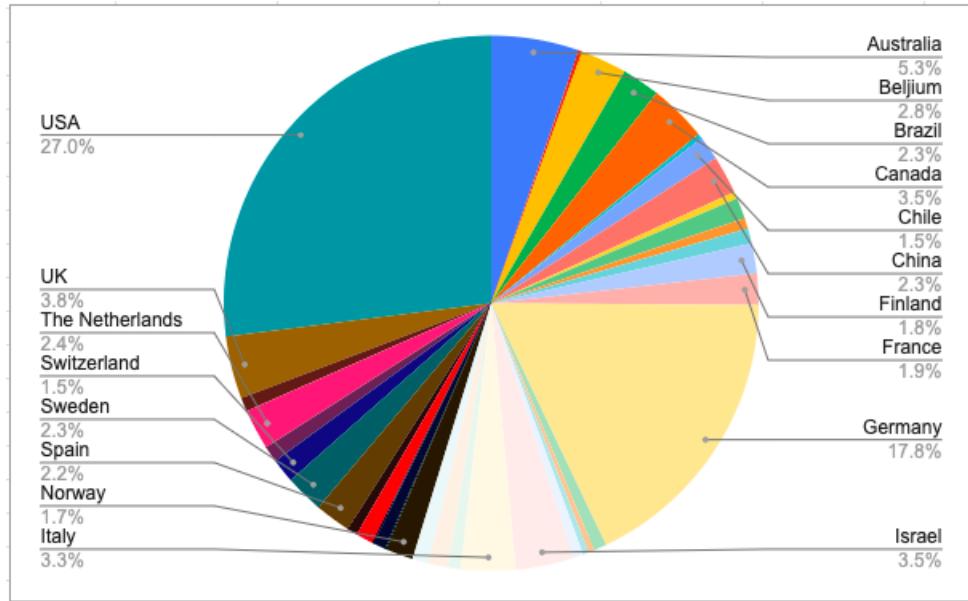
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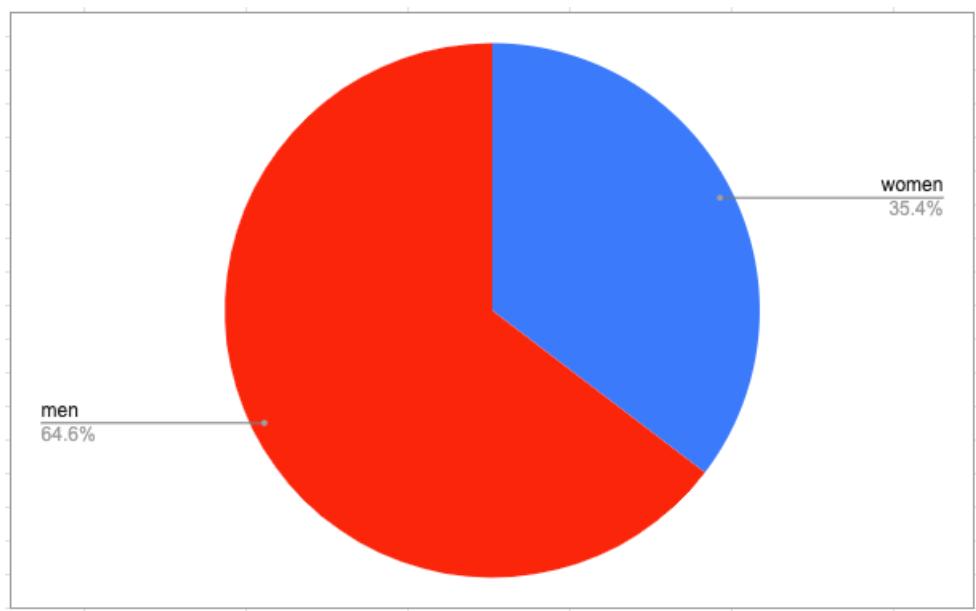
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